



SEQUENCE LISTING

GENERAL INFORMATION:

- 7200
- (i) APPLICANTS: Chen, Yao-Tseng; Stockert, Elisabeth; Chen, Yachi; Garin-Chesa, Pilar; Rettig, Wolfgang J.; van der Bruggen, Pierre; Boon-Falleur, Thierry; Old, Lloyd J.
- (ii) TITLE OF INVENTION: MONOCLONAL ANTIBODIES WHICH BIND TO TUMOR REJECTION ANTIGEN PRECURSOR MAGE-1, RECOMBINANT MAGE-1, AND MAGE-1 DERIVED IMMUNOGENIC PEPTIDES
- (iii) NUMBER OF SEQUENCES: 4
- (iv) CORRESPONDENCE ADDRESS:
 (A) ADDRESSEE: Felfe & Lynch
 (B) STREET: 805 Third Avenue
 (C) CITY: New York City
 (D) STATE: New York
 (F) ZIP: 10022
- (v) COMPUTER READABLE FORM:
 (A) MEDIUM TYPE: Diskette, 5.25 inch, 360 kb storage
 (B) COMPUTER: IBM
 (C) OPERATING SYSTEM: PC-DOS
 (D) SOFTWARE: Wordperfect
- (vi) CURRENT APPLICATION DATA:
 (A) APPLICATION NUMBER: 08,190,411
 (B) FILING DATE: 01-FEBRUARY-1994
 (C) CLASSIFICATION: 435
- (vii) PRIOR APPLICATION DATA:
 (A) APPLICATION NUMBER: 037,230
 (B) FILING DATE: 26-MARCH-1993
- (vii) PRIOR APPLICATION DATA:
 (A) APPLICATION NUMBER: PCT/US92/04354
 (B) FILING DATE: 22-MAY-1992
- (viii) PRIOR APPLICATION DATA:
 (A) APPLICATION NUMBER: 07/807,043
 (B) FILING DATE: 12-DECEMBER-1991
- (ix) PRIOR APPLICATION DATA:
 (A) APPLICATION NUMBER: 07/764,364
 (B) FILING DATE: 23-SEPTEMBER-1991
- (x) PRIOR APPLICATION DATA:
 (A) APPLICATION NUMBER: 07/728,838
 (b) FILING DATE: 9-JULY-1991

"Express Mail" mailing label
 Number 126 5924 234536
 Date of Deposit NOV 17, 1995
 I hereby certify that this paper or fee is
 being deposited with the United States Postal
 Service "Express Mail Post Office to
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 date indicated above and is addressed to the
 Commissioner of Patents and Trademarks,
 Washington, D.C. 20231.

FELFE & LYNCH
Brian R. M' Lane
 (Printed name)
Brian R. M' Lane
 (Signature)

(xi) PRIOR APPLICATION DATA:

(A) APPLICATION NUMBER: 07/705,702

(B) FILING DATE: 23-MAY-1991

(xii) ATTORNEY/AGENT INFORMATION:

(A) NAME: Hanson, Norman D.

(B) REGISTRATION NUMBER: 30,946

(C) REFERENCE/DOCKET NUMBER: LUD 354

(xiii) TELECOMMUNICATION INFORMATION:

(A) TELEPHONE: (212) 688-9200

(B) TELEFAX: (212) 838-3884

(2) INFORMATION FOR SEQUENCE ID NO: 1:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: ⁵⁷²⁴~~5724~~ base pairs

(B) TYPE: nucleic acid

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: genomic DNA

(ix) FEATURE:

(A) NAME/KEY: MAGE-1 gene

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 1:

10/14/98

CCCGGGGCAC	CACTGGCATC	CCTCCCCCTA	CCACCCCCAA	TCCCTCCCTT	50
TACGCCACCC	ATCCAAACAT	CTTCACGCTC	ACCCCCAGCC	CAAGCCAGGC	100
AGAATCCGGT	TCCACCCCTG	CTCTCAACCC	AGGGAAGCCC	AGGTGCCCAG	150
ATGTGACGCC	ACTGACTTGA	GCATTAGTGG	TTAGAGAGAA	GCGAGGTTTT	200
CGGTCTGAGG	GGCGGCTTGA	GATCGGTGGA	GGGAAGCGGG	CCCAGCTCTG	250
TAAGGAGGCA	AGGTGACATG	CTGAGGGAGG	ACTGAGGACC	CACTTACCCC	300
AGATAGAGGA	CCCCAAATAA	TCCCTTCATG	CCAGTCCTGG	ACCATCTGGT	350
GGTGGACTTC	TCAGGCTGGG	CCACCCCCAG	CCCCCTTGCT	GCTTAAACCA	400
CTGGGGACTC	GAAGTCAGAG	CTCCGTGTGA	TCAGGGAAGG	GCTGCTTAGG	450
AGAGGGCAGC	GTCCAGGCTC	TGCCAGACAT	CATGCTCAGG	ATTCTCAAGG	500
AGGGCTGAGG	GTCCCTAAGA	CCCCACTCCC	GTGACCCAAC	CCCCACTCCA	550
ATGCTCACTC	CCGTGACCCA	ACCCCCTCTT	CATTGTCATT	CCAACCCCCA	600
CCCCACATCC	CCCACCCCAT	CCCTCAACCC	TGATGCCCAT	CCGCCCAGCC	650
ATTCCACCCT	CACCCCCACC	CCCACCCCCA	CGCCCCACTCC	CACCCCCACC	700
CAGGCAGGAT	CCGGTTCCCG	CCAGGAAACA	TCCGGGTGCC	CGGATGTGAC	750
GCCACTGACT	TGCGCATTGT	GGGGCAGAGA	GAAGCGAGGT	TTCCATTCTG	800
AGGGACGGCG	TAGAGTTCGG	CCGAAGGAAC	CTGACCCAGG	CTCTGTGAGG	850
AGGCAAGGTG	AGAGGCTGAG	GGAGGACTGA	GGACCCCGCC	ACTCCAAATA	900
GAGAGCCCCA	AATATTCCAG	CCCCGCCCTT	GCTGCCAGCC	CTGGCCCACC	950
CGCGGGAAGA	CGTCTCAGCC	TGGGCTGCCC	CCAGACCCCT	GCTCCAAAAG	1000
CCTTGAGAGA	CACCAGGTTC	TTCTCCCCAA	GCTCTGGAAT	CAGAGGTTGC	1050
TGTGACCAGG	GCAGGACTGG	TTAGGAGAGG	GCAGGGCACA	GGCTCTGCCA	1100
GGCATCAAGA	TCAGCACCCA	AGAGGGAGGG	CTGTGGGCCC	CCAAGACTGC	1150
ACTCCAATCC	CCACTCCCAC	CCCATTGCGA	TTCCCATTCC	CCACCCAACC	1200
CCCATCTCCT	CAGCTACACC	TCCACCCCCA	TCCCTACTCC	TACTCCGTCA	1250
CCTGACCACC	ACCCTCCAGC	CCCAGCACCA	GCCCCAACCC	TTCTGCCACC	1300

TCACCCTCAC	TGCCCCCAAC	CCCACCCTCA	TCTCTCTCAT	GTGCCCCACT	1350
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CCAGGGAAGC	CCTGGTAGGC	CCGATGTGAA	ACCACTGACT	TGAACCTCAC	1450
AGATCTGAGA	GAAGCCAGGT	TCATTTAATG	GTTCTGAGGG	GCGGCTTGAG	1500
ATCCACTGAG	GGGAGTGGTT	TTAGGCTCTG	TGAGGAGGCA	AGGTGAGATG	1550
CTGAGGGAGG	ACTGAGGAGG	CACACACCCC	AGGTAGATGG	CCCCAAAATG	1600
ATCCAGTACC	ACCCCTGCTG	CCAGCCCTGG	ACCACCCGGC	CAGGACAGAT	1650
GTCTCAGCTG	GACCACCCCC	CGTCCCGTCC	CACTGCCACT	TAACCCACAG	1700
GGCAATCTGT	AGTCATAGCT	TATGTGACCG	GGGCAGGGTT	GGTCAGGAGA	1750
GGCAGGGCCC	AGGCATCAAG	GTCCAGCATC	CGCCCGGCAT	TAGGGTCAGG	1800
ACCCTGGGAG	GGAAGTGAGG	GTTCCCCACC	CACACCTGTC	TCCTCATCTC	1850
CACCGCCACC	CCACTCACAT	TCCCATACCT	ACCCCTTACC	CCCAACCTCA	1900
TCTTGTCAGA	ATCCCTGCTG	TCAACCCACG	GAAGCCACGG	GAATGGCGGC	1950
CAGGCACTCG	GATCTTGACG	TCCCCATCCA	GGGTCTGATG	GAGGGAAGGG	2000
GCTTGAACAG	GGCCTCAGGG	GAGCAGAGGG	AGGGCCCTAC	TGCGAGATGA	2050
GGGAGGCCTC	AGAGGACCCA	GCACCCTAGG	ACACCGCACC	CCTGTCTGAG	2100
ACTGAGGCTG	CCACTTCTGG	CCTCAAGAAT	CAGAACGATG	GGGACTCAGA	2150
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GGGAGGACTC	AGGGGACCTT	GGAATCCAGA	TCAGTGTGGA	CCTCGGCCCT	2250
GAGAGGTCCA	GGGCACGGTG	GCCACATATG	GCCCATATTT	CCTGCATCTT	2300
TGAGGTGACA	GGACAGAGCT	GTGGTCTGAG	AAGTGGGGCC	TCAGGTCAAC	2350
AGAGGGAGGA	GTTCCAGGAT	CCATATGGCC	CAAGATGTGC	CCCCTTCATG	2400
AGGACTGGGG	ATATCCCCGG	CTCAGAAAGA	AGGGACTCCA	CACAGTCTGG	2450
CTGTCCCCTT	TTAGTAGCTC	TAGGGGGACC	AGATCAGGGA	TGGCGGTATG	2500
TTCCATTCTC	ACTTGTAACA	CAGGCAGGAA	GTTGGGGGGC	CCTCAGGGAG	2550
ATGGGGTCTT	GGGGTAAAGG	GGGGATGTCT	ACTCATGTCA	GGGAATTGGG	2600
GGTTGAGGAA	GCACAGGCGC	TGGCAGGAAT	AAAGATGAGT	GAGACAGACA	2650
AGGCTATTGG	AATCCACACC	CCAGAACCAA	AGGGGTCAGC	CCTGGACACC	2700
TCACCCAGGA	TGTGGCTTCT	TTTTCACTCC	TGTTTCCAGA	TCTGGGGCAG	2750
GTGAGGACCT	CATTCTCAGA	GGGTGACTCA	GGTCAACGTA	GGGACCCCCA	2800
TCTGGTCTAA	AGACAGAGCG	GTCCCAGGAT	CTGCCATGCG	TTGCGGTGAG	2850
GAACATGAGG	GAGGACTGAG	GGTACCCACG	GACCAGAACA	CTGAGGGAGA	2900
CTGCACAGAA	ATCAGCCCTG	CCCCTGCTGT	CACCCACAGG	AGCATGGGCT	2950
GGGCCGTCTG	CCGAGGTCCT	TCCGTTATCC	TGGGATCATT	GATGTCAGGG	3000
ACGGGGAGGC	CTTGGTCTGA	GAAGGCTGCG	CTCAGGTCAG	TAGAGGGAGC	3050
GTCCCAGGCC	CTGCCAGGAG	TCAAGGTGAG	GACCAAGCGG	GCACCTCACC	3150 3100
CAGGACACAT	TAATTCCAAT	GAATTTTGAT	ATCTCTTGCT	GCCCTTCCCC	3200 3150
AAGGACCTAG	GCACGTGTGG	CCAGATGTTT	GTCCCCTCCT	GTCCTTCCAT	3250 3200
TCCTTATCAT	GGATGTGAAC	TCTTGATTTG	GATTTCTCAG	ACCAGCAAAA	3300 3250
GGGCAGGATC	CAGGCCCTGC	CAGGAAAAAT	ATAAGGGCCC	TGCGTGAGAA	3350 3300
CAGAGGGGGT	CATCCACTGC	ATGAGAGTGG	GGATGTCACA	GAGTCCAGCC	3400 3350
CACCCCTCCTG	GTAGCACTGA	GAAGCCAGGG	CTGTGCTTGC	GGTCTGCACC	3450 3400
CTGAGGGCCC	GTGGATTCTT	CTTCCTGGAG	CTCCAGGAAC	CAGGCAGTGA	3500 3450
GGCCTTGGGT	TGAGACAGTA	TCCTCAGGTC	ACAGAGCAGA	GGATGCACAG	3550 3500
GGTGTGCCAG	CAGTGAATGT	TTGCCCTGAA	TGCACACCAA	GGGCCCCACC	3600 3550
TGCCACAGGA	CACATAGGAC	TCCACAGAGT	CTGGCCTCAC	CTCCCTACTG	3650 3600
TCAGTCCTGT	AGAATCGACC	TCTGCTGGCC	GGCTGTACCC	TGAGTACCCT	3700 3650
CTCACTTCCT	CCTTCAGGTT	TTCAGGGGAC	AGGCCAACCC	AGAGGACAGG	3750 3700
ATTCCCTGGA	GGCCACAGAG	GAGCACCAGG	GAGAAGATCT	GTAAGTAGGC	3800 3750
CTTTGTTAGA	GTCTCCAAGG	TTCAGTTCTC	AGCTGAGGCC	TCTCACACAC	3850 3800
TCCCTCTCTC	CCCAGGCCTG	TGGGTCTTCA	TTGCCAGCT	CCTGCCACAC	3900 3850
CTCCTGCCTG	CTGCCCTGAC	GAGAGTCATC			3950 3880
ATG TCT CTT	GAG CAG AGG	AGT CTG CAC	TGC AAG	CCT GAG GAA	3972 3922
GCC CTT GAG	GCC CAA CAA	GAG GCC	CTG GGC	CTG GTG TGT	4014 3964

10/14/88
DAD

10/19/98
PAD

CAG GCT GCC ACC TCC TCC TCC TCT CCT CTG GTC CTG GGC ACC	4056 4006
CTG GAG GAG GTG CCC ACT GCT GGG TCA ACA GAT CCT CCC CAG	4098 4048
AGT CCT CAG GGA GCC TCC GCC TTT CCC ACT ACC ATC AAC TTC	4140 4090
ACT CGA CAG AGG CAA CCC AGT GAG GGT TCC AGC AGC CGT GAA	4182 4132
GAG GAG GGG CCA AGC ACC TCT TGT ATC CTG GAG TCC TTG TTC	4224 4174
CGA GCA GTA ATC ACT AAG AAG GTG GCT GAT TTG GTT GGT TTT	4266 4216
CTG CTC CTC AAA TAT CGA GCC AGG GAG CCA GTC ACA AAG GCA	4308 4258
GAA ATG CTG GAG AGT GTC ATC AAA AAT TAC AAG CAC TGT TTT	4350 4300
CCT GAG ATC TTC GGC AAA GCC TCT GAG TCC TTG CAG CTG GTC	4392 4342
TTT GGC ATT GAC GTG AAG GAA GCA GAC CCC ACC GGC CAC TCC	4434 4384
TAT GTC CTT GTC ACC TGC CTA GGT CTC TCC TAT GAT GGC CTG	4476 4426
CTG GGT GAT AAT CAG ATC ATG CCC AAG ACA GGC TTC CTG ATA	4518 4468
ATT GTC CTG GTC ATG ATT GCA ATG GAG GGC GGC CAT GCT CCT	4560 4510
GAG GAG GAA ATC TGG GAG GAG CTG AGT GTG ATG GAG GTG TAT	4602 4552
GAT GGG AGG GAG CAC AGT GCC TAT GGG GAG CCC AGG AAG CTG	4644 4594
CTC ACC CAA GAT TTG GTG CAG GAA AAG TAC CTG GAG TAC GGC	4686 4636
AGG TGC CGG ACA GTG ATC CCG CAC GCT ATG AGT TCC TGT GGG	4728 4678
GTC CAA GGG CCC TCG CTG AAA CCA GCT ATG TGA	4761 4711
AAGTCCTTGA GTATGTGATC AAGGTCAGTG CAAGAGTTC	4800 4750
GCTTTTCTT CCCATCCCTG CGTGAAGCAG CTTTGAGAGA GGAGGAAGAG	4850 4800
GGAGTCTGAG CATGAGTTGC AGCCAAGGCC AGTGGGAGGG GGACTGGGCC	4900 4850
AGTGCACCTT CCAGGGCCGC GTCCAGCAGC TTCCCCTGCC TCGTGTGACA	4950 4900
TGAGGCCCCAT TCTTCACTCT GAAGAGAGCG GTCAGTGTTT TCAGTAGTAG	5000 4950
GTTTCTGTTC TATTGGGTGA CTTGGAGATT TATCTTTGTT CTCTTTTGGA	5050 5000
ATTGTTCAAA TGTTTTTTTT TAAGGGATGG TTGAATGAAC TTCAGCATCC	5100 5050
AAGTTTATGA ATGACAGCAG TCACACAGTT CTGTGTATAT AGTTTAAGGG	5150 5100
TAAGAGTCTT GTGTTTTATT CAGATTGGGA AATCCATTCT ATTTTGTGAA	5200 5150
TTGGGATAAT AACAGCAGTG GAATAAGTAC TTAGAAATGT GAAAAATGAG	5250 5200
CAGTAAATA GATGAGATAA AGAACTAAAG AAATTAAGAG ATAGTCAATT	5300 5250
CTTGCCTTAT ACCTCAGTCT ATTCTGTAAA ATTTTAAAG ATATATGCAT	5350 5300
ACCTGGATTT CCTTGGCTTC TTTGAGAATG TAAGAGAAAT TAAATCTGAA	5400 5350
TAAAGAATTC TTCCTGTTCA CTGGCTCTTT TCTTCTCCAT GCACTGAGCA	5450 5400
TCTGCTTTTT GGAAGGCCCT GGGTTAGTAG TGGAGATGCT AAGGTAAGCC	5500 5450
AGACTCATAC CCACCCATAG GGTCTAGAG TCTAGGAGCT GCAGTCACGT	5550 5500
AATCGAGGTG GCAAGATGTC CTCTAAAGAT GTAGGGAAAA GTGAGAGAGG	5600 5550
GGTGAGGGTG TGGGGCTCCG GGTGAGAGTG GTGGAGTGTC AATGCCCTGA	5650 5600
GCTGGGGCAT TTTGGGCTTT GGGAACTGC AGTTCCTTCT GGGGGAGCTG	5700 5650
ATTGTAATGA TCTTGGGTGG ATCC	5724 5674

- (2) INFORMATION FOR SEQUENCE ID NO: 2:
- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 14 amino acids
 - (B) TYPE: amino acid
 - (D) TOPOLOGY: linear
 - (ii) MOLECULE TYPE: protein
 - (xi) SEQUENCE DESCRIPTION: SEQ ID NO: 2:

Ile Asn Phe Thr Arg Gln Arg Gln Pro Ser Glu Gly Ser Ser

(2) INFORMATION FOR SEQUENCE ID NO: 3:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 12 amino acids

(B) TYPE: amino acid

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 3:

Leu Phe Arg Ala Val Ile Thr Lys Lys Val Ala Asp
5 10

(2) INFORMATION FOR SEQUENCE ID NO: 4:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 12 amino acids


(B) TYPE: amino acid

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 4:

Asp Val Lys Glu Ala Asp Pro Thr Gly His Ser Tyr
5 10



(1) GENERAL INFORMATION:

JU 253.6-JEL/NDH

(ii) NUMBER OF SEQUENCES: 4

(2) INFORMATION FOR SEQUENCE ID NO: 1:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 5724 base pairs

(B) TYPE: Nucleic acid

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: genomic DNA

(ix) FEATURE:

(A) NAME/KEY: MAGE-1 gene

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 1:

CCCGGGGCAC CACTGGGCATC CCTCCCCCTA CCACCCCCAA TCCCTCCCTT 50
 TACGCCACCC ATCCAAACAT CTTCACGCTC ACCCCCAGCC CAAGCCAGGC 100
 AGAATCCGGT TCCACCCCTG CTCTCAACCC AGGGAAGCCC AGGTGCCCAG 150
 ATGTGACGCC ACTGACTTGA GCATTAGTGG TTAGAGAGAA GCGAGGTTTT 200
 CGGTCTGAGG GCGGGCTTGA GATCGGTGGA GGAAGCGGG CCCAGCTCTG 250
 TAAGGAGGCA AGGTGACATG CTGAGGGAGG ACTGAGGACC CACTTACCCC 300
 AGATAGAGGA CCCCATAATA TCCCTTCATG CCAGTCCTGG ACCATCTGGT 350
 GGTGGACTTC TCAGGCTGGG CCACCCCCAG CCCCCTTGCT GCTTAAACCA 400
 CTGGGGACTC GAAGTCAGAG CTCCGTGTGA TCAGGGAAGG GCTGCTTAGG 450
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 CCCCACATCC CCCACCCCAT CCCTCAACCC TGATGCCCAT CCGCCAGCC 650
 ATTCCACCCT CACCCCCACC CCCACCCCCA CGCCCACTCC CACCCCCACC 700
 CAGGCAGGAT CCGGTTCCCG CCAGGAACA TCCGGGTGCC CGGATGTGAC 750
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 CCTTGAGAGA CACCAGGTTC TTCTCCCCAA GCTCTGGAAT CAGAGGTTGC 1050
 TGTGACCAGG GCAGGACTGG TTAGGAGAGG GCAGGGCACA GGCTCTGCCA 1100
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 ACTCCAATCC CCACTCCAC CCCATTGCA TTCCCATTC CCACCCAACC 1200
 CCCATCTCCT CAGCTACACC TCCACCCCCA TCCCTACTCC TACTCCGTCA 1250
 CCTGACCACC ACCCTCCAGC CCCAGACCA GCCCCAAACC TTCTGCCACC 1300
 TCACCCTCAC TGCCCCCAAC CCCACCCTCA TCTCTCTCAT GTGCCCCACT 1350
 CCCATCGCCT CCCCATTCT GGCAGAATCC GGTTTGCCCC TGCTCTCAAC 1400
 CCAGGGAAGC CCTGGTAGGC CCGATGTGAA ACCACTGACT TGAACCTCAC 1450
 AGATCTGAGA GAAGCCAGGT TCATTTAATG GTTCTGAGGG GCGGCTTGAG 1500
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 ACCCTGGGAG GGAAGTGAAG GTTCCCCACC CACACCTGTC TCCTCATCTC 1850
 CACCGCCACC CCACTCACAT TCCCATACCT ACCCCCTACC CCCAACCTCA 1900
 TCTTGTCAGA ATCCCTGCTG TCAACCCACG GAAGCCACGG GAATGGCGGC 1950

CAGGCACTCG GATCTTGACG TCCCCATCCA GGGTCTGATG GAGGGAAGGG 2000
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 ACTGAGGCTG CCACTTCTGG CCTCAAGAAT CAGAACGATG GGGACTCAGA 2150
 TTGCATGGGG GTGGGACCCA GGCCTGCAAG GCTTACGCGG AGGAAGAGGA 2200
 GGGAGGACTC AGGGGACCTT GGAATCCAGA TCAGTGTGGA CCTCGGCCCT 2250
 GAGAGGTCCA GGGCACGGTG GCCACATATG GCCCATATTT CCTGCATCTT 2300
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 CAGGACACAT TAATTCCAAT GAATTTTGAT ATCTCTTGCT GCCCTTCCCC ~~3200~~ 3150
 AAGGACCTAG GCACGTGTGG CCAGATGTTT GTCCCCTCCT GTCCTTCCAT ~~3250~~ 3200
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 ATG TCT CTT GAG CAG AGG AGT CTG CAC TGC AAG CCT GAG GAA ~~3972~~ 3922
 GCC CTT GAG GCC CAA CAA GAG GCC CTG GGC CTG GTG TGT GTG ~~4014~~ 3964
 CAG GCT GCC ACC TCC TCC TCC TCT CCT CTG GTC CTG GGC ACC ~~4056~~ 4006
 CTG GAG GAG GTG CCC ACT GCT GGG TCA ACA GAT CCT CCC CAG ~~4098~~ 4048
 AGT CCT CAG GGA GCC TCC GCC TTT CCC ACT ACC ATC AAC TTC ~~4140~~ 4090
 ACT CGA CAG AGG CAA CCC AGT GAG GGT TCC AGC AGC CGT GAA ~~4182~~ 4132
 GAG GAG GGG CCA AGC ACC TCT TGT ATC CTG GAG TCC TTG TTC ~~4224~~ 4174
 CGA GCA GTA ATC ACT AAG AAG GTG GCT GAT TTG GTT GGT TTT ~~4266~~ 4216
 CTG CTC CTC AAA TAT CGA GCC AGG GAG CCA GTC ACA AAG GCA ~~4308~~ 4258
 GAA ATG CTG GAG AGT GTC ATC AAA AAT TAC AAG CAC TGT TTT ~~4350~~ 4300
 CCT GAG ATC TTC GGC AAA GCC TCT GAG TCC TTG CAG CTG GTC ~~4392~~ 4342
 TTT GGC ATT GAC GTG AAG GAA GCA GAC CCC ACC GGC CAC TCC ~~4434~~ 4384

TAT GTC CTT GTC ACC TGC CTA GGT CTC TCC TAT GAT GGC CTG 4476 4426
 CTG GGT GAT AAT CAG ATC ATG CCC AAG ACA GGC TTC CTG ATA 4518 4468
 ATT GTC CTG GTC ATG ATT GCA ATG GAG GGC GGC CAT GCT CCT 4560 4510
 GAG GAG GAA ATC TGG GAG GAG CTG AGT GTG ATG GAG GTG TAT 4602 4552
 GAT GGG AGG GAG CAC AGT GCC TAT GGG GAG CCC AGG AAG CTG 4644 4594
 CTC ACC CAA GAT TTG GTG CAG GAA AAG TAC CTG GAG TAC GGC 4686 4636
 AGG TGC CGG ACA GTG ATC CCG CAC GCT ATG AGT TCC TGT GGG 4728 4678
 GTC CAA GGG CCC TCG CTG AAA CCA GCT ATG TGA 4761 4711
 AAGTCCTTGA GTATGTGATC AAGGTCAGTG CAAGAGTTC 4800 4750
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 GGAGTCTGAG CATGAGTTGC AGCCAAGGCC AGTGGGAGGG GGACTGGGCC 4900 4850
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 ATTGTAATGA TCTTGGGTGG ATCC 5724 5674